

# (12) UK Patent Application (19) GB (11) 2 295 801 (13) A

(43) Date of A Publication 12.06.1996

(21) Application No 9524183.2

(22) Date of Filing 27.11.1995

(30) Priority Data

(31) 4443525 (32) 07.12.1994 (33) DE

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(51) INT CL<sup>6</sup>

B60J 10/12

(52) UK CL (Edition O )

B7B BPG B287  
E1J JGN

(56) Documents Cited

US 4729593 A US 4678227 A US 4529243 A  
US 4474402 A

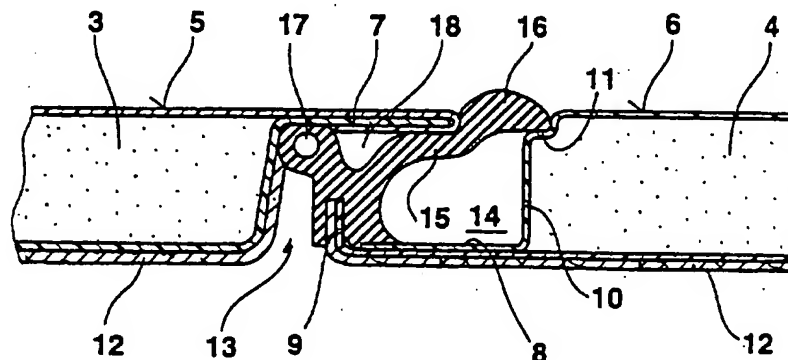
(58) Field of Search

UK CL (Edition O ) B7B BAC BCJ BG BPG  
INT CL<sup>6</sup> B60J 7/04 7/043 7/05 7/10 7/12 10/08

(54) Sealing arrangement for movable vehicle roof panels with a drainage channel.

(57) An arrangement for sealing one or more movable roof panels 5, 6 arranged one behind the other. An elongate compliant sealing member 15 with a bead 16 at the free end, is fixed to the front lip 9 of a drainage channel 14 running across the front of the rearmost of any two roof panels 6 and is naturally in a raised condition (Fig. 3) to act as a splash guard when the roof is open. When the roof is closed an extension of the top surface 7 of the front of any two panels 5 engages the seal below the bead and urges it into a horizontal position with the tip of the sealing member engaging a notch 11 in the top surface of the rear panel to close and seal the drain channel and the joint between the two panels. An additional hollow cross sectional sealing member 17 may also engage the underside of the extension 7 to form a further drainage channel 18.

Fig. 2



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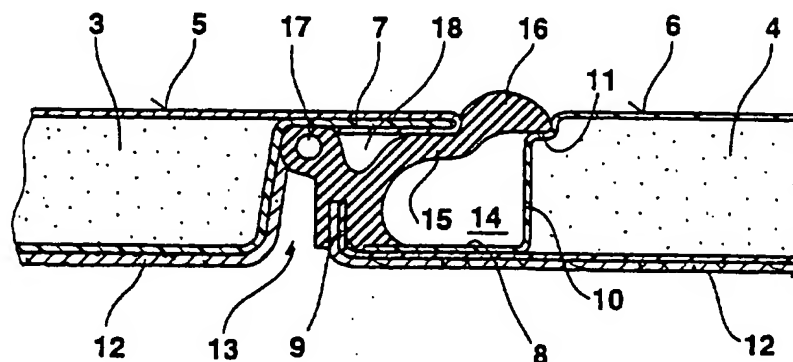
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Fig. 2



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Roof arrangement for closing off a roof  
opening of a motor vehicle

The invention relates to a roof arrangement for closing off a roof opening of a motor vehicle, having at least one roof part which is arranged in a movable manner and having a roof part which is adjacent towards the rear in the vehicle longitudinal direction and, in the region of its end side which faces the movable roof part, is provided with an elastic seal which extends along an elongate joint between the adjacent roof parts.

Such a roof arrangement is known from DE 35 45 870 C2. Said roof arrangement exhibits an elastic seal in the region of a water-discharge means of the rear roof part. The elastic seal is provided with an elastically compliant lug which is in an upright state when the roof part has been pushed back and is an integral part of the elastic seal. However, said lug is arranged in the region of the front border of the roof cutout since the elastic seal constitutes the seal for the sliding roof cover.

A roof arrangement is also known from GB 2 259 284 A. The roof arrangement is a lamella roof which exhibits a plurality of movable lamella roof parts. The lamella roof part which is adjacent towards the rear in the vehicle longitudinal direction in each case exhibits, in the region of its front end side, an elastic hollow-profile seal which, when the lamella roof is in the closed state, interacts with a corresponding rear end side of the lamella roof part which is adjacent towards the front, and seals the longitudinal joint between the adjacent lamella roof parts.

US-A 4 664 439 discloses a further roof arrangement, which exhibits a roof part which can be opened out upwards or removed. Adjacent to said movable roof part towards the rear in the vehicle longitudinal direction is a stationary roof part of the motor vehicle, which stationary roof part bounds the roof cutout to the rear and, on the edge which butts against the movable roof part, is provided

with an elastic hollow-profile seal. Provided beneath the elastic hollow-profile seal of the stationary roof part is a water-discharge channel on whose front edge is arranged a splash guard which projects upwards in the non-loaded state and is in the form of an elastic web profile. In the closed state of the movable roof part, said web profile rests in a corresponding convexity of the abutment edge, facing the stationary roof part, of the movable roof part.

The present invention seeks to provide a roof arrangement of the type mentioned in the first paragraph, which exhibits a seal which is improved in terms of construction and function.

According to the present invention there is provided a roof arrangement for closing off a roof opening of a motor vehicle, having at least one roof part which is arranged in a movable manner and having a roof part which is adjacent towards the rear in the vehicle longitudinal direction and, in the region of its end side which faces the movable roof part, is provided with an elastic seal which extends along an elongate joint between the adjacent roof parts, wherein the elastic seal is arranged on a water-discharge means of the rear roof part and exhibits an integral, elastically compliant sealing section which, by means of an abutment edge of the movable roof part, depending on an opening or a closing movement of said roof part, is moveable between a relieved rest position, in which it is opened out upwards, and a loaded position, in which it covers over the water-discharge means in a sealing manner and seals the elongate joint.

Thus, the sealing section, by means of an abutment edge of the movable roof part in the event of a closing movement of the said roof part, can be moved into a loaded position, in which it covers over the water-discharge means in a sealing manner and seals the elongate joint. In addition to its function for sealing the roof arrangement, the seal thus serves to assist the water-discharge means, in that, by virtue of being opened out upwards, it constitutes

a splash guard. Since the sealing section is integral with the seal, merely a single component is necessary for fulfilling the various functions. The roof arrangement according to the invention may be realized both in the form of a lamella roof with a plurality of adjoining lamella roof parts and in the form of an individual roof part which can be opened out or removed and/or can be moved in a sliding manner.

In one development of the invention, the sealing section exhibits a bead which, when the roof cutout is closed, projects upwards through a gap remaining in the region of the longitudinal joint between the roof parts and projects out beyond the outer contour of the roof parts. The bead of the sealing section forms an elevation, which provides visual compensation for the differences in level of the roof parts with respect to one another and for any tolerances occurring in the region of the longitudinal joint. In addition, said bead forms an additional damper for adjacent abutment edges of the roof parts. The bead is advantageous, in particular, in a roof arrangement which is designed as a lamella roof with a plurality of roof parts arranged one behind the other.

In a further development of the invention, the seal is provided with a hollow-profile section which, when the roof cutout is closed, rests in a sealing manner against an associated underside of the movable roof part. Said hollow-profile section constitutes an additional seal which, moreover, exerts a damping action on the movable roof part.

In a further development of the invention, the seal is arranged on the rear roof part, forming a front wall of the water-discharge means in the process. Since the seal itself forms one of the walls of the water-discharge means, a simplified form of the water-discharge means with an angular profile is sufficient.

In a further development of the invention, the seal is plugged onto a web of the rear roof part in the region of the water-discharge means. This is a simple and

functionally reliable method of fastening for the seal.

In a further development of the invention, between the sealing section and the hollow-profile section, the seal exhibits an outflow duct which runs parallel to said sections and is intended for water which has entered by capillary action. Consequently, the seal has a further additional function.

Further advantages and features of the invention are given in the following description of a preferred exemplary embodiment of the invention, which exemplary embodiment is represented in the drawings, in which:

Fig. 1 shows, in a perspective representation, part of a passenger car whose roof is provided with an embodiment of an inventive roof arrangement in the form of a lamella roof which exhibits six lamella roof parts,

Fig. 2 shows, in an enlarged representation, a section through the roof arrangement according to Fig. 1 along section line II-II in Fig. 1, and

Fig. 3 shows the rear of the two lamella roof parts according to Fig. 2, in a position in which the front lamella roof part - not shown - is separated from the rear lamella roof part.

A passenger car 1 according to Fig. 1 exhibits, in the region of its roof, a roof opening or cutout which exposes the interior of the passenger compartment and can be closed off by means of a roof arrangement 2. The roof arrangement 2 is a lamella roof which, in its closed position, forms a sheet-like planar lamella assembly comprising a plurality of lamella roof parts. In order to open the lamella roof, the various lamella roof parts can be moved rearwards in the vehicle longitudinal direction by means of a drive device, in which case said lamella roof parts gradually separate in a rear region of the roof cutout and open out obliquely upwards such that they are lined up in a row one against the other. In the planar lamella assembly, i.e. when the lamella roof has been closed, a

front lamella roof part 3 adjoins a rear lamella roof part 4 in a flush manner, the surface 5 of the front lamella roof part 3 and the surface 6 of the rear lamella roof part 4 being located approximately at the same level in a common plane and thus being in alignment with one another. That side of the lamella roof parts 3, 4 which projects towards the interior exhibits a cladding 12 in each case. The front lamella roof part 3 exhibits, in the region of its rear end, in extension of the surface 5, a web-like continuation 7 which, in the closed state of the lamella roof, overlaps a front end side of the rear lamella roof part 4 at a distance. The front end side of the rear lamella roof part 4 exhibits, in extension of an underside, a continuation 8 which projects forwards in the manner of a web and whose free end is bent upwards in the direction of the web-like continuation 7 of the other lamella roof part 3 in order to form a plug-on border 9. An angular profile, which constitutes a channel which is open at the top and is intended for a water-discharge means, is formed by an end edge 10 of the lamella roof part 4, the continuation 8 and the plug-on border 9.

By means of a plug-on profile, an elastic seal 13 produced from rubber is plugged onto the plug-on border 9 of the water-discharge means and is retained thereon in a stable manner. The elastic seal 13 is produced in one piece and exhibits a profile which extends over the entire length of the plug-on border 9, i.e. over the entire width of the lamella roof part 4 and of the corresponding roof cutout of the passenger car. The elastic seal 13 exhibits two sections 15, 17, which project in the manner of a V and form between them a channel-like depression in the form of an outflow duct 18. One of the two sections is a hollow-profile section 17 which projects towards the adjacent lamella roof part 3 and, in the closed state of the lamella roof, rests in a sealing manner against the underside of the web-like continuation 7, in a corner region thereof. Said hollow-profile section 17 serves, on the one hand, for sealing and,

on the other hand, for damping movements of the lamella roof part 3 which occur when the vehicle is in motion.

The other section constitutes a sealing section 15 which projects towards the lamella roof part 4 and, in the relieved, non-loaded state Fig. 3, projects obliquely upwards. The length of the sealing section 15 is dimensioned such that its free end can be supported on a shoulder 11 of the lamella roof part 4 above the end edge 10. The sealing section 15 is elastically compliant, such that it is pressed against the shoulder 11 by means of the web-like continuation 7 of the adjacent lamella roof part 3, during closure of the lamella roof, and thus closes off the water-discharge means 14. The outer side of the profile of the sealing section 15 is formed such that it exhibits an undulation which forms a resting surface for the web-like continuation. In the non-loaded state, the sealing section 15 projects beyond the surface 6 of the lamella roof part 4, with the result that the inner side of the sealing section 15 forms, on the one hand, that wall of the water-discharge means 14 which is located opposite the end edge 10 and, on the other hand, a splash guard. As soon as the loading by means of the web-like continuation 7, in the closed state of the lamella roof, has been removed from the sealing section 15, the latter automatically opens out obliquely upwards into the rest position represented in Fig. 3. In contrast, in the loaded state Fig. 2, the sealing section 15 closes off the water-discharge means 14 in a sealing manner. In the region of its free end, the sealing section 15 additionally exhibits, on its outer side, a bead 16 which, in the loaded position of the sealing section 15, in which the latter bears on the shoulder 11, is arranged between the remaining gap of the longitudinal joint between the two lamella roof parts 3, 4, between the surface 5 and the surface 6. The bead 16 projects out upwards, in the profile, in the manner of a hump beyond the surfaces 5 and 6 of the two lamella roof parts 3, 4. This elevation provides visual compensation, on the one hand, for tolerances due to



different gap sizes between the various lamella roof parts of the lamella roof and, on the other hand, for differences in level between the respectively adjacent surfaces 5, 6 of the various lamella roof parts 3, 4.

In the closed state of the lamella roof, in which state the hollow-profile section 17 bears in a sealing manner on the underside of the web-like continuation 7 of the lamella roof part 3 and the sealing section 15 bears in a sealing manner on the shoulder 11 of the lamella roof part 4, closing off the water-discharge means 14 in the process, the outflow duct 18 is formed between said sections on the underside of the web-like continuation 7, which duct serves to channel away water which has entered by capillary action. Both the outflow duct 18 and the water-discharge means 14 each lead into water channels which are arranged laterally on the roof cutout.

Claims

1. A roof arrangement for closing off a roof opening of a motor vehicle, having at least one roof part which is arranged in a movable manner and having a roof part which is adjacent towards the rear in the vehicle longitudinal direction and, in the region of its end side which faces the movable roof part, is provided with an elastic seal which extends along an elongate joint between the adjacent roof parts, wherein the elastic seal is arranged on a water-discharge means of the rear roof part and exhibits an integral, elastically compliant sealing section which, by means of an abutment edge of the movable roof part, depending on an opening or a closing movement of said roof part, is moveable between a relieved rest position, in which it is opened out upwards, and a loaded position, in which it covers over the water-discharge means in a sealing manner and seals the elongate joint.

2. A roof arrangement according to Claim 1, wherein the sealing section has a bead which, when the roof opening is closed, projects upwards through a gap remaining in the region of the elongate joint between the roof parts and projects out beyond the outer contour of the roof parts.

3. A roof arrangement according to Claim 2, wherein the elastic seal is provided with a hollow-profile section which, when the roof opening is closed, rests in a sealing manner against an associated underside of the movable roof part.

4. A roof arrangement according to any one of the preceding claims, wherein the elastic seal is arranged on the rear roof part, and forms a front wall of the water-discharge means.

5. A roof arrangement according to Claim 4, wherein the elastic seal is secured onto a plug-on web of the rear roof part in the region of the water-discharge means.

6. A roof arrangement according to any one of the preceding claims, wherein, between the sealing section and the hollow-profile section, the elastic seal has an outflow duct which runs parallel to said sections and is intended for water which has entered by capillary action.

7. A roof arrangement according to any one of the preceding claims, wherein a plurality of movable roof panels in parallel relationship is provided.

8. A roof arrangement for closing off a roof opening of a motor vehicle, substantially as described herein with reference to and as illustrated in the accompanying drawings.



Application No: GB 9524183.2  
Claims searched: All

Examiner: John Twin  
Date of search: 9 January 1996

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.O): B7B (BAC BCJ BG BPG) E1J (JGN JGM)

Int CI (Ed.6): B60J 7/04, 043, 05, 10/08, 10, 12

Other:

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
X	US 4678227 (FIAT) Fig. 2 See Col 2, lines 4-10.	1,2,4,5
X	US 4529243 (ASC) Fig. 7 Notice resilient seal member 132 closing roof sections above channel 128.	1
X	US 4474402 (GENERAL MOTORS) Resilient member 36 closing channel formed by 26, 24, 32.	1
A	US 4729593 (MAZDA) Fig. 2 A seal member also used as a discharge means.	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.